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DEPRECIATION OF CAPITAL EQUIPMENT AND AMORTIZATION IN THE USSR

Replacement of worn-out machinery and other types of capital equipment may be either complete or partial. Complete replacement takes place when machinery is fully worn out and can no longer be used as a means of production. This type of replacement is called capital construction and may take the form either of construction of a new enterprise or of replacement of obsolete machinery.

Of more frequent occurrence, however, is partial replacement of capital equipment, which is known as capital repair and which consists of the renovation of machinery, buildings, and other equipment which deteriorated in the process of production.

Simultaneously with physical replacement of worn-out equipment there is economic replacement of that equipment, known as amortization, which is included in the cost of production. Amortization charges constitute the financial resources used in capital repair and capital construction.

Amortization charges are made only for equipment actually used in the production process. Damage sustained by plant or equipment due to natural hazards or war is not included in amortization charges.

Preservation of capital equipment and its replacement are assuming an important role in USSR industrial development. The growth of capital equipment and the increase of its load sharply increased the amount of annual amortization charges. In the course of the Stalin five-year plans these charges increased about ten times and constitute at present (1947) about 5 billion rubles annually. Of this sum at least 2-2.5 billion rubles are spent on capital repair.

Amortization charges play an important part in calculating cost of production and constitute a substantial item in shop and plant expenditures. In such branches of industry as petroleum, coal, and electric power, amortization charges constitute the most important element of production cost.

Prior to 1938, no special amortization were made for capital repair. Commissariats and main administrations fixed the amounts for capital repair without any reference to amortization charges, while the enterprises themselves had no right to dispose of any part of these charges. This was changed by the decree of 8 January 1938, which provides that a fixed percentage of amortization charges be reserved for capital repair and the amount placed at the disposal of the plant director. The State Bank carries special capital repair accounts for each enterprise.

The remaining sum of amortization charges is deposited with the Industrial Bank and is used to finance capital construction.

Though the capital repair fund is at the disposal of the plant director, the latter cannot spend it arbitrarily but must follow the annual and quarterly plans for capital repair worked out by the main administrations of the ministry. If, during a given year, the capital repair fund has not been fully spent, the enterprise is credited with the unused portion of the fund which can be used in any subsequent year. The State Bank is charged with the responsibility of checking the proper expenditure of capital repair funds by all enterprises.

Amortization charges deposited in the Industrial Bank and intended for capital construction can be spent by ministries only in accordance with the plan for capital investment approved by the government.

Amortization Rates

Amortization rates are percentages used in determining annual amortization charges. The percentages differ with different equipment. Even the same equipment may have different amortization rates at different times, depending on conditions under which the equipment is operated.

Amortization rates depend on three factors: (1) cost of equipment; (2) duration of use of equipment; and (3) the method of computing the amortization charge per unit of time.

To the extent that capital equipment of industry is composed of different types of machinery and means of production, there is the possibility of computing an average rate of amortization which represents the annual percentage of the total value of capital equipment of an enterprise or of a branch of production. In this case the average rate of amortization, in addition to the factors already mentioned, will also depend on the composition of the capital equipment. The greater the share of machinery and transport equipment, the higher the amortization rates.

In determining the cost of equipment for the purpose of fixing amortization rates, it is not sufficient to take into account solely the original cost of equipment. In the machinery industry capital goods undergo capital repair from six to eight times during their lifetime. Experience shows that the total capital repair of a machine amounts to from 50 to 60 percent of the original cost. Capital repair must therefore be included in the amount for which amortization charges are made.

On the other hand, toward the end of the period during which a piece of equipment has been in use, approximately 4 to 5 percent of the equipment's original value remains. This amount is excluded from the sum for which amortization charges are computed. If the original cost of equipment is designated as Ce, capital repair expenditures as R, and the remaining scrap as S, the amortization charges will be equal to Ce + R - S.

[redacted] rates, is difficult to determine beforehand, since the useful life of equipment depends on a number of factors relating both to the quality of that equipment and to the conditions under which it operates.

There are several methods of calculating the amortization rate: using a constant rate, accelerating rate, decelerating rate, or a rate depending on the time the equipment is actually in use. The simplest and most widely used method is the constant rate of amortization. In this method the annual amortization charge is given by the formula $\frac{Ce + R - S}{t}$, where t is the period of service and the other symbols are as above. Annual amortization as a percentage of original value would be given by the formula

$$\frac{100\ (Ce + R - S)}{t \times Ce}$$

Example: If the full original value of a machine is 80,000 rubles, expenditures for capital repair during the whole period the machine functions are 50,000 rubles, the residual value of the scrap is 5,000 rubles, and the period of service is 20 years, then the annual amortization charge will be:

$$\frac{80,000 + 50,000 - 5,000}{20} = \frac{125,000}{20} = 6,250 \text{ rubles}$$

and the annual rate of amortization (in percent of the original value of the equipment) is: $\frac{100\ (80,000 + 50,000 - 5,000)}{20 \times 80,000} = 7.7$ percent

Note that this does not mean that the life of the machine is 13 years. It is 20 years.

This is the method of amortization currently in use in Soviet industry.

Planning Amortization Deductions

It is necessary to plan amortization in order to plan capital repair, calculate cost of production, make up a balance sheet of income and expenditures, and draw up credit plans.

In practice, industry calculates the following when determining amortization for a period of a year:

1. The value of the fixed assets in operation at the beginning of the year.
2. The value of the fixed assets which are to be introduced.
3. The average annual value of the fixed assets to be introduced.
4. The value of property retired.
5. The average annual value of the property retired.
6. The total value of fixed assets in operation at the end of the year.
7. The value of average fixed assets in operation for which amortization charges are made.
8. The average rate of amortization.

9. [illegible] charges deducting those for residential buildings.

10. The portion of the amortization charges to be spent on capital repair.

Inasmuch as amortization rates are established by the Council of Ministers (and for individual enterprises by ministries), the main problem for enterprises is calculating the value of average fixed assets in operation during the year.

Suppose that, in the year for which the plan is made, it has been determined that new fixed assets in the following amounts will be put into operation on the following dates: on 1 May 0.6 million rubles, on 1 July 0.9, on 1 November 1.2, and on 1 December 0.8, a total of 3.5 million rubles.

Since these fixed assets are not to be in operation all year, but only for a few months of the year, the average annual value of assets being introduced must be calculated. This is obtained by multiplying the value of the assets by the number of months in operation and dividing by 12, as follows:

$0.6 \times 8 = 4.8$

$0.9 \times 6 = 5.4$

$1.2 \times 2 = 2.4$

$0.8 \times 1 = 0.8$

13.4

$\frac{13.4}{12} = 1.12$ million rubles

The average annual volume of fixed assets retired is calculated similarly. If fixed assets valued at 0.2 million rubles are retired on 1 June and fixed assets valued at 0.15 million rubles are retired on 1 October, the average annual value of fixed assets retired will be:

$$\frac{(0.2 \times 7) + (0.15 \times 3)}{12} = 0.15 \text{ million rubles}$$

If the value of fixed assets in operation at the beginning of the year is 24 million rubles, average fixed assets in operation during the year will be $24 + 1.12 - 0.15 = 24.97$ million rubles.

When the exact dates on which fixed assets are to be retired or introduced are not known, the value of average fixed assets in operation during the year is calculated as the arithmetical average of fixed assets in operation at the end of the year. If the value of fixed assets on 1 January is A, the value of fixed assets to be introduced during the year is B, and the value of fixed assets to be retired during the year is C, then the value of fixed assets at the end of the year will be $A + B - C$. The average value of fixed assets in operation during the year will be

$$\frac{A + (A + B - C)}{2}$$

Using this and the average rate of amortization, the total amortization charge for the plan year can be calculated easily.

In addition to the average rate of amortization, there are different rates of amortization for the various types of fixed assets, since the periods of service of machinery, tools, and buildings are different.

To calculate amortization charges for individual machines and types of equipment, the amortization rates in effect during the first two five-year plans are used. These rates were introduced on 28 July 1930 and were in effect until 8 January 1938.

The main trouble with the 1930 amortization rates was that they did not correspond to actual wear or to the degree of utilization of capacity, and also that they did not specify how much of the amortization charge was to be used for capital repair and how much for full replacement.

For most branches of industry, the average rates of amortization established by the Council of People's Commissars of the USSR on 8 January 1938 are higher than the 1930 amortization rates. The allocations from amortization payments for capital repair are very much higher than before.

However, the 1930 amortization rates have one advantage which explains why they are still used. They take into account differences between various types of machinery and equipment, differences in the nature of buildings (whether productional or nonproductional, brick, wood, or adobe), differences in the nature of installations, shift coefficients, and equipment load. The 1930 amortization rates are as follows (in percent):

Buildings used for productional purposes	2.25 to 5.5
Buildings used for other than productional purposes	2 to 7
Constructions other than buildings	2 to 7
Technical equipment and installations	4.5 to 9.5
Transport	5 to 20
Tools	10 to 18
Inventory (inventar')	10 to 15

If there is a difference between the amortization charge calculated on the basis of the average rate and the amortization charge calculated according to the 1930 rates, the 1930 rates are corrected to agree with the charge calculated on the basis of the average rate, as in the following example:

Suppose the value of the fixed assets of a plant is 20 million rubles. Assume the buildings to be worth 4 million rubles; constructions other than buildings, 8 million rubles; equipment and installations, 10.5 million rubles; tools, 0.5 million rubles; transport, 2 million rubles; and inventory, one million rubles. Assume the average amortization rate for the factory to have been set at 10 percent, which amounts to 2 million rubles.

According to the 1930 amortization rates, the factory's amortization charges would be:

	Amortization rate (percent)	Charge (thousand rubles)
Buildings	2.5	100
Constructions other than buildings	4.0	80
Equipment and installations	9.0	945
Tools	15.0	75
Inventory	12.0	120
Transport	10.0	200
Total		1,520

ble below.

	Percent of Cost of Total of Fixed Assets	Amortization Charge at 1936 Rate (thousand rubles)	Correction (thousand rubles)	Amortization Charge at New Rate (thousand rubles)
Buildings	20	100	96	196
Constructions other than buildings	10	80	48	128
Equipment and installations	52.5	945	252	1,197
Tools	2.5	75	12	87
Inventory	5.0	120	24	144
Transport	10.0	200	48	248
	100.0	1,520	480	2,000

Actual amortization deduction may be different from planned deductions in the following cases: (1) nonfulfillment of the capital construction plan, resulting in a lower volume of fixed assets than planned; (2) fire or other accidents which diminish the value of the enterprise's fixed assets; (3) transfer of equipment to the enterprise from another enterprise or from the enterprise to another enterprise by decree of the Council of Ministers; (4) if the plan of capital construction was revised upward during the year and the new plan was fulfilled; and (5) if, because of an accident, part of all the enterprise was not in working order part of the time.

These are the only instances in which actual amortization charges may differ from those provided for in the plan. Greater or lesser utilization of capacity does not change amortization charges. Hence, in industries where amortization charges form a large part of the production cost (such as the crude petroleum industry where they amount to about 40 percent), more intensive use of productive capacity will result in a larger product without a correspondingly large increase in total cost, and the cost per unit of product will be considerably reduced.

Not only must amortization charges be in proportion to actual wear of plant and equipment, but they must also be properly divided up between capital repair and capital construction. If too small a proportion is used for capital repair, plant and equipment will be retired sooner than they should be. This was a serious difficulty during the Second Five-Year Plan. In 1932 only 33 percent of the total amortization funds was spent on capital repair and in 1936 only 27 percent. It is not sufficient under ordinary circumstances to spend less than 35-40 percent on capital repair, and with the intensive utilization of capacity which was characteristic of the Second Five-Year Plan, at least 50 percent of amortization funds should have been spent on capital repair. Insufficiency of funds for repair during the Second Five-Year Plan led to the practice of removing parts from spare equipment. As a result of this practice, thousands of ring-spinning frames, totaling 448,000 spindles, were put out of order in the cotton cloth industry of the USSR by the beginning of 1937.

Specific percentages of amortization charges for expenditure on capital repair were established for the first time in a decree of the Council of People's Commissars of the USSR on 8 January 1938. These rates varied from 40 to 65 percent of the total amortization charges, the lowest being for the machine-tool industry, which has the newest equipment, and the highest for light industry, which had a high percentage of old equipment in need of major repairs. The rates established are as follows:

	Percent of the Cost of Production of Fixed Assets to be Spent on Capital Repair	Percent of Amortization to be Spent on Capital Repair
Heavy industry	2.4	43
Machinery industry	2.2	40
Defense industry	2.6	47
Timber industry	3.0	50
Light industry	3.6	65
Food industry	2.8	46

In the period from 1938 through 1940 capital repair amounted to 10-15 percent of total capital investment, as compared with 4 percent in the First Five-Year Plan. In the Second Five-Year Plan capital repair amounted to about 6 percent of all capital investment in industry.

	Expenditures on Capital Repair (million rubles)		Percent of Total Capital Investment	
	1938	1939	1938	1939
Coal industry	224.5	166.7	9.6	10.9
Petroleum industry	-	154.4	-	10.7
Ferrous metallurgy	226.8	273.7	18.7	20.0
Construction materials industry	35.9	97.5	14.1	20.6
Heavy machinery industry	-	63.5	-	11.9
Timber industry	92.2	121.1	13.2	17.6
Textile industry	188.2	233.3	18.7	22.4
Light industry	58.3	73.0	13.4	16.2
Fish industry	22.0	54.9	9.1	16.2
Meat and dairy industry	49.7	74.1	12.1	15.8
Food industry	138.3	184.1	13.1	14.3
Local industry	64.4	32.2	12.0	9.2
Industrial cooperatives	61.2	100.8	16.0	16.5
Invalids' cooperatives	11.9	16.4	17.0	16.2

Even these large allocations to capital repair have proved insufficient in some cases. In recent years the textile industry and light industry have spent more than the total amortization charge on capital repair. In other industries it has become customary to spend most of the amortization charge on capital repair.

This situation is explained, primarily, by the run-down condition of equipment. The disorganized state of repair work during the Second Five-Year Plan resulted in premature deterioration of equipment. During World War II repair

of equipment was also continued on a sufficiently large scale because of a shortage of trained personnel and spare parts. Hence, greater expenditures on repair are required now.

Another reason for such large expenditures on capital repair is that repair work is too expensive in many plants.

In view of the fact that insufficient amounts have been spent on capital repair for many years, it is natural that more than half of amortization charges should be allocated to capital repair at the present time and in the near future. Under ordinary conditions, however, only 35-45 percent should be spent on capital repair and the rest on full replacement of equipment. Expenditures on capital repair during the period of service of a machine (or other equipment) should not, as a rule, exceed 50-60 percent of the original cost.

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